ALTERNATIVE WAVELENGTHS FOR LASER RANGING

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To accomplish multicolor laser ranging we should consider :
* the nature of the atmospheric dispersion and absorption,
* the Satellite/Lunar/Ground retro array characteristics,
* Ground/Satellite ranging machine performance.

The existing atmospheric dispersion models [1,2] are perhaps valid up to 1 cm accuracy. It is evident, the higher time interval difference of a chosen pair, the requirements on the ground / satellite instrument are less stringent. The energy balance and jitter budget have to be considered, as well.

The existing Satellite / Lunar retro arrays show serious limitation to accomplish a multicolor experiment [3].

The fieldable picosecond lasers, considered up to now, have the origin on the NdYAG transition (1.06um) and its harmonics (0.53 um, 0.35um), Raman Stokes transition (0.68 um) of 0.53 um in Hydrogen [4,5], Titanium Sapphire (0.8 / 0.4 um) and Alexandrite. We do propose the Raman Stokes / Raman Anti Stokes pair of 0.53 um (0.68 um/0.43 um) and Cr:LiSAF (0.8/0.4 um).

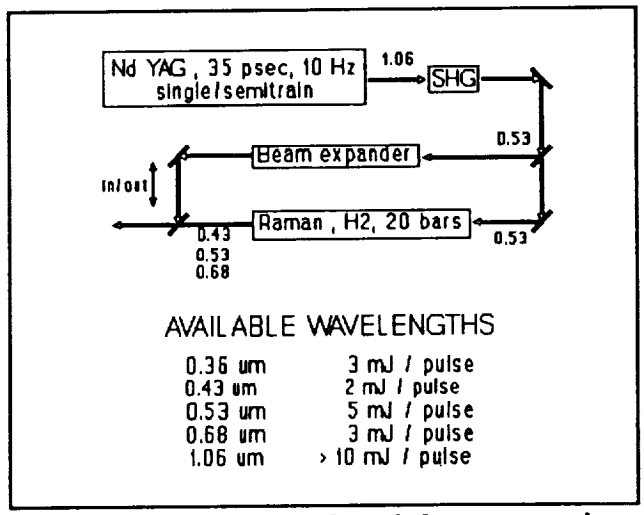

Figure 1 Multiple wavelength laser transmitter
The 3HG may replace the Raman tube

The streak detector experiments carried out in Prague on a ground target (0.53/0.35 um), (0.53/0.68 um) [4], (0.53/1.06 um) and in Graz [5] on Ajisai and Starlette satellites proved the expectancy, however, indicated the complexity. On the other hand, the solid state detector technology offers a remarkable simplicity and compactness with the access to the near infrared. The experiment (0.53/0.68 um) accomplished in Graz [6] indicates a chance, if data averaging requirements will be fulfilled.

Since several years ago, Alexandrite based Fundamental / SHG lasers do not show to much progress. Using the Titanium Sapphire based laser, the scheme is becoming quite complex because of short relaxation time (3 useconds) of the metastable level of the active medium.

The new material Li:SAF [7] tunable around 800 nm, having 66 usec relaxation

time,looks promising related to the spectral response of existing vacuum and solid state detectors and the atmospheric propagation and dispersion, as well.

At the conclusion : the existing Satellite / Lunar retroreflectors seem to be not adequate for the future experiments. The Raman Stokes/Anti Stokes (0.68/0.43um) plus solid state detector look as a promising instrumentation satisfying the Ground/Satellite and Satellite/Ground ranging machine requirements on the precision, compactness and data processing.

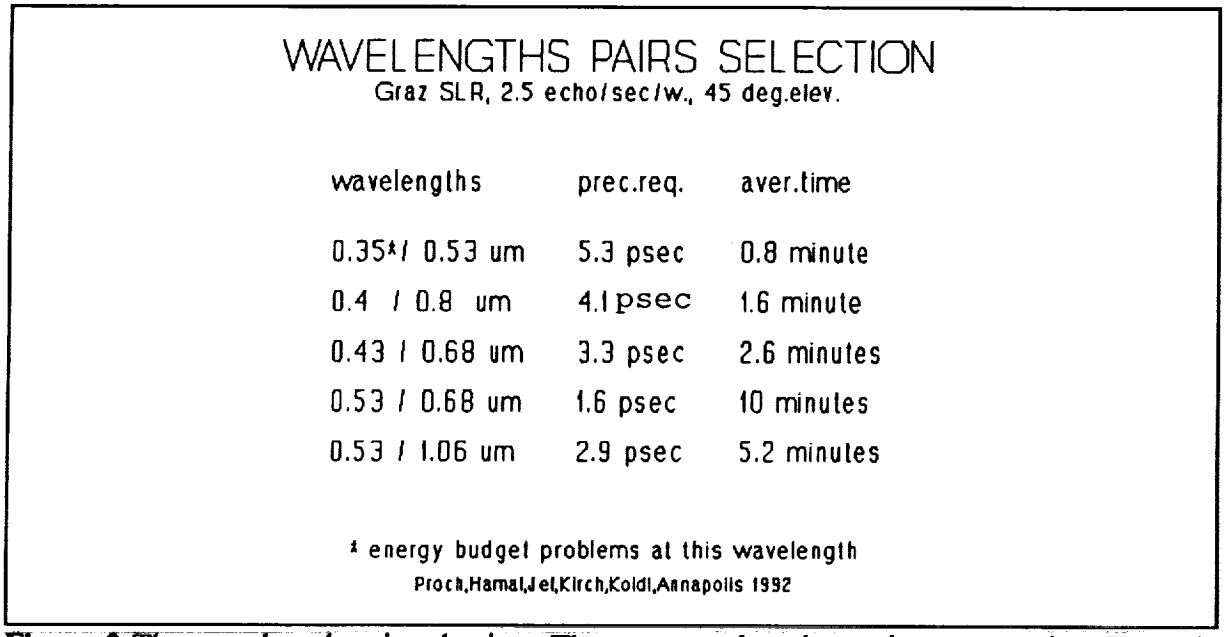

Figure 2 The wavelength pair selection. The two wavelength ranging setup using SPAD is expected, the mean elevation 45 degrees is expected, the SPAD jitter dependence versus wavelength is taken into account.

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